



Constellation-X Requirements Flow Down

Science Goals

Parameters of Supermassive Black Holes

Search for Dark Matter

Investigate Faint Sources

Plasma Diagnostics from Stars to Clusters

Measurement Capabilities

Effective area:

15,000 cm² at 1 keV
6,000 cm² at 6.4 keV
1,500 cm² at 40 keV

Band pass:

0.25 to 40 keV

Spectral resolving power ($E/\Delta E$):

≥ 300 from 0.25 to 6.0 keV
≥ 3000 at 6 keV
≥ 10 at 40 keV

System angular resolution and FOV:

15 arc sec HPD and
FOV > 2.5' (0.25 to 10 keV)

1 arc min HPD and
FOV > 8' (10 to 40 keV)

Engineering Implications

Effective area:

- Light weight, highly nested, large diameter (1.6 m) optics
- Long focal length (8-10 m)

Band pass:

- 2 types of telescopes to cover energy range

Spectral resolving power:

- Dispersive and non-dispersive capability to cover energy band

System angular resolution and FOV:

- Tight tolerances on telescope figure, surface finish, alignment
- ≥ 30 x 30 array for x-ray calorimeter (pixels ~5")
- Cryocooler driven by array size and readout electronics

Key Technologies

High throughput optics:

- High performance replicated segments and shells
- High reflectance coatings
- High strength/mass materials for optical surfaces

High energy band:

- Multilayer optics
- CdZnTe detectors

High spectral resolution:

- 2 eV calorimeter arrays
- Coolers
- Lightweight gratings
- CCD arrays extending to 0.25 keV

Optical bench:

- Stable (time and temp.)
- High strength/low weight materials